

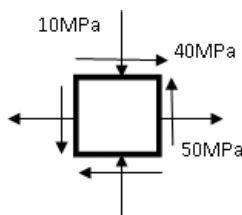
**End Semester Examinations - 2015-16 Even Semester - May 2016**

**14ME3039 Experimental Stress Analysis**

**Set A**

**Time : 3 hrs**  
**Total Marks: 100**

1. a) What is the condition for a material under plane stress? (2 marks)
- b) For the state of stress shown in figure (18 marks)
- (i) construct Mohr's circle,
- (ii) determine the principal stresses,
- (iii) determine the maximum shearing stress and the corresponding normal stress.



**OR**

2. A three-element rectangular rosette strain gage is mounted on a steel specimen. For a particular state of loading of the structure the strain gage readings are  $\epsilon_A = 200\mu$ ,  $\epsilon_B = 900\mu$ , and  $\epsilon_C = 1000\mu$ . Determine the values and Orientations of the principal stresses and the value of the maximum shear stress at the point. Let  $E = 200$  GPa. and Poisson's ratio  $\nu = 0.285$
3. a) What are the primary advantages of constantan material used in strain gages. (6 marks)
- b) Obtain a relation for the sensitivity of a conductor in terms of Poisson's ratio ( $\nu$ ), resistivity ( $\rho$ ) and normal strain. (8 marks)
- c) A strain gage with transverse sensitivity factor of 6 percent is mounted on a specimen which at the strain gage location has a strain of  $\epsilon_a = 500\mu$  and  $\epsilon_t = 2400\mu$ . Determine the indicated strain. (6 marks)

**OR**

4. a) Draw two and three-wire quarter bridge circuits. What is the advantage of three-wire quarter bridge circuit? (6 marks)
- b) Discuss temperature effects on strain gages. How the actual strain is measured? Discuss in detail with suitable graph. (14 marks)
5. a) Derive phase shift relation of light wave in a medium of depth  $d$ ;  $\Delta = (n_r - 1)d$  (4 marks) where  $\Delta$  = phase shift (4 marks)
- b) Explain isoclinic fringe analysis of disk loaded in compression (16 marks)
- OR**
6. a) Explain circularly polarized light. (10 marks)
- b) Derive the basic photo-elastic equation (10 marks)
7. a) Explain threshold strain in calibration strip of a brittle-coating method. (3 marks)
- b) What is three-dimensional photoelasticity? (3 marks)

c) Describe the properties of a ideal photoelastic material. (14 Marks)

**OR**

8. a) Explain Moire fringe formation briefly. (6 marks)

b) Describe Moire fringe analysis for the case of pure extension with no rotation. (14 marks)

9. Explain digital image processing used in digital photoelasticity.

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**Wishing you All the Best**

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